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A nutrition intervention study's effect to hematology profiles on elderly group in social retirement home

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ABSTRACT

The increase in the elderly brings consequences, including a higher risk of disease. Inappropriate nutritional intake is also known as one of the risk factors related to the elderly's non-communicable diseases, and nutritional intervention is essential to improve the elderly nutritional status and quality of life. It was an interventional study with a before-after one-group approach. The study was conducted for three months (October-December 2021) in three social retirement homes. The intervention given was supplementation with additional protein sources and snacks each day. The biochemistry profiles were taken 2 times: before and after three months of intervention, comprised of HbA1c, lipid, transferrin, creatinine, and blood pressure level. The data will be analyzed for its normality before being processed with paired t-test or Wilcoxon signed rank based on the normality results. The analysis results show that there are significantly lower transferrin levels (p=0.040), an increase in cholesterol level (p=0.000), and low-density lipoprotein (LDL) level increased from 114.05±32.03 to 125.94±31.41 (p=0.000). There is also a remarkable decrease in hemoglobin (p=0.005) and high-density lipoprotein (HDL) levels. Conversely, there are an increase in HbA1C (p=0.007) and triglyceride level (p=0.005). There is no significant difference in creatinine level. We conclude that nutrition interventions have a significant effect on elderly blood profiles. However, to achieve an improvement, the study should consider physical activity and other variables that might be altering the results.

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1. INTRODUCTION

During the years 2000 and 2019, there was an increase in life expectation number by six years, followed by the rise of the global elderly (people aged 60 and beyond) [1]. Similarly, Indonesia had an increase of the elderly population by 5.9 million in four years (2017-2021) [2]. Although this condition resembles the higher access to health care and better social determinants of the population, [3] this condition might lead to an increase in the elderly's health problems [4], [5] and the need for appropriate elderly health care [6].

The elderly commonly experience frequent health issues caused by the decrease in the body's physiological and cognitive function, as also depression symptoms [7]. Therefore, they are more vulnerable to non-communicable diseases, including cardiovascular diseases (ischemic heart failure and stroke), chronic

lung diseases, cancer, Alzheimer, diabetes mellitus, and renal failure [8], [9]. A similar pattern was observed in Indonesia [10]. Based on the National Health Survey (2018), stroke prevalence reaching half of the population aged 65 and beyond. Furthermore, 32.5% of the elderly suffered from hypertension [11].

Inappropriate nutritional intake was also known as one of the risk factors related to the elderly's non-communicable diseases [12]. The absorption system in the elderly was deteriorated, which led to a higher risk of malnutrition. The malnutrition level in this vulnerable group was in line with the non-infectious disease severity [13], [14]. Several factors also related to the onset of malnutrition comprise age, physical, physical (level of disability), and mental health [15]. Besides, a previous study stated found that the number of elderly in the social nursing house who were suffered from malnutrition was 39% and further it significantly correlated with participant's fraility level [16].

In this regard, nutritional intervention is essential to improve the elderly's nutritional status and quality of life. The precedent study also found that dietary and nutrition intervention in this population could improve HDL, red blood cells, and hematocrit number, reduce triglyceride levels in converse [17], lower malnutrition-caused pneumonia severity, and prevent dementia and sarcopenia [18]–[20]. Therefore, we aimed to evaluate the effect of nutrition intervention on blood biochemistry profiles in the eldery group of "Tresna Werdha" Social Retirement Home.

2. METHOD

This study was an interventional study with a before-after (pre-post) one-group approach. The study was conducted for three months (October-December 2021) in three social retirement homes. Based on the sample calculation result, [21] the minimum number for the study was 76 people. An additional 10% increase was applied in the number of participants to anticipate drop out during the study. The final required number of participants was 86. Participants were recruited using purposive sampling. The inclusion criteria of the research were: willingness to enroll study, Aged 60 and beyond; and being a non-smoker. The exclusion criteria were: Didn't have a history of dementia or cognitive disorder, didn't have the autonomy to decide the enrollment based on incapacity to understand the research procedures, aged under 60 based on the civilian record, and passed away during the study.

During the study, the participants were given breakfast, a morning snack, and lunch each day for three months. The intervention given was supplementation with additional protein sources and snacks each day. The biochemistry profiles were taken 2 times: before and after three months of intervention, comprised of HbA1c, lipid, transferrin, kreatinin, and blood pressure level. The data were analyzed using SPSS 25.00 version. The data were analyzed for its normality before being processed with paired t-test or Wilcoxon signed rank based on the normality results. This research got approval from the Research Ethics Committe Faculty of Medicine, Public Health, and Nursing, Universitas Gadjah Mada No. KE/FK/1236/EC/2021 by 16 November 2021.

3. RESULTS AND DISCUSSION

3.1. Participant's characteristics

In total, there were 86 elderly who participated in this study. Based on the sample calculation result, this number met the minimum number of participants. The characteristics of the participants were analysed, including gender and age as shown in Table 1. Most participants were women (63%), and half were aged 70-79.

3.2. The effects of the intervention

To examine the nutrition intervention effect on elderly blood biochemistry profiles, specifically in transferrin, cholesterol, and HDL level, we applied paired sample t-test. The parametric test results are shown in Table 2. The analysis results show that there are significantly lower transferrin levels (p=0.040), an increase in cholesterol level (p=0.000), and low-density lipoprotein (LDL) level increased from 114.05±32.03 to 125.94±31.41 (p=0.000).

Furthermore, the profiles of Hb, HbA1C, creatinin, HDL, and triglyceride non-parametric analysis results are shown in Table 3. The analysis results show that there is a significant decrease in hemoglobin (p=0.005) and high-density lipoprotein (HDL) level. Conversely, there is an increase in HbA1C (p=0.007) and triglyceride level (p=0.005). There is no significant difference in creatinin level.

Table 1. Characteristics of the respondents

Characteristics	n	%
Gender		
Male	32	37
Female	54	63
Age (years)		
60-69	27	31
70-79	43	50
80-89	14	16
90-99	1	1
≥100	1	1

Table 2. The pre-post intervention differences of the level of transferin, cholesterol, dan LDL

Variables	N	Mean±SD		p
		Pre-intervention	Post-intervention	
Transferin	86	232.34±33.87	227.24±33.98	0.040*
Cholesterol	86	183.93±36.06	197.34±38.16	0.000*
LDL	86	114.05±32.03	125.94±31.41	0.000*

*p-significant<0.05

Table 3. The pre-post intervention results differences of the level of Hb, HbA1C, Creatinin, HDL, and Triglyceride

Variables	N	Median±SD		p
		Pre-intervention	Post-Intervention	
Hb	86	13.03±1.68	12.94±1.82	0.005*
HbA1C	86	6.34±1.21	6.55±4.77	0.007*
Creatinin	86	0.93±0.20	0.94±0.25	0.512
HDL	86	49.05±22.49	44.06±12.45	0.033*
Trigliseride	86	133.85±92.59	147.69±82.02	0.005*

*p significant<0.05

3.2. Discussion

Several previous studies found that nutrition interventions positively reduce disease severity and disease risks in the elderly [14], [17], [18], [22]. Interestingly, the result of this study showed a converse finding. Although most of the blood parameters had significant differences, it was inversely proportional to the expected finding.

Transferrin saturation is one of the biomarkers of iron deficiency anemia (IDB) which is cheap and widely available in most laboratories, [23] besides hemoglobin level measurement [24]. Another study also found that blood transferrin levels of elderly with anemia were significantly lower than those without ($p<0.001$) [25]. However, in this study's finding, the hemoglobin level and transferrin saturation decreased after three months of intervention. This result might be caused by the diseases the participants suffered, which were not adjusted as a confounder, such as inflammatory illnesses [23] and chronic kidney diseases [26] that correlate with serum transferrin saturation and anemia.

Glycosylated haemoglobin A1c (HbA1c) emerged in the twentieth century as the most commonly used and well-understood indicator, and it has been the gold standard in diabetes management ever since [27]. Based on the ADA standards, HbA1c≥6.5% (48 mmol/mol) was diagnosed as diabetes, while HbA1c between 5.7% and 6.4% (39 and 46 mmol/mol) was considered as prediabetes [27]. The study result shows that the HbA1C level in participants increased after the intervention, and even more, was indicated as diabetic (post-intervention HbA1C level was 6.55±4.77). The diet portion that only considered Body Mass Index might be the reason. A similar previous study stated that the nutrition intervention for the elder group should consider their illnesses, including diabetes. The intervention also should be combined with physical activity and glycemic control [28].

The intervention also resulted in a higher level of fat profiles, including cholesterol, HDL, and LDL. This increase raises a concern about the higher risk of cardiovascular disease, specifically in a diabetic person [29]–[31]. It might be because this study has no specific dietary supplementation or restriction regarding a blood lipid improvement diet and monitoring physical activity. Previous intervention studies found that dietary intervention by omega-3 fatty acids and plant sterol or sterols supplementation might reduce triglycerides and cholesterol levels in patients with hypercholesterolemia [32]. In a person who consumes statin daily, the supplementation of n-3 in their diet showed an improvement in general lipid profiles [33]. On the other hand, a physical activity limitation in older adults leads to decreased oxygen absorption and further

alters organ function, antioxidant efficiency, and cellular maintenance, including the cardiovascular system [34]. In addition, physical activity is also a significant factor that affects lipid metabolism and should be evaluated in studies related to blood lipids [33].

The creatinine level is significantly associated with chronic kidney disease (CKD) [35]. The finding of this study shows that the serum creatinine level was normal in both pre- and post-interventions, and there was no significant difference between them as well. For reducing creatinine levels, a high-fiber diet is recommended [36]. Furthermore, some factors potentially make the biased results: i) physical activity, ii) problem with the laboratory assay, and iii) the amount of creatinine in the diet [37]. 95% of the body's creatinine is found in muscular and nutrition intervention combined with physical activity will effectively maintain the creatinine level in its normal range [38], [39].

Nutrition intervention in older adults is essential to maintain their nutritional status and immunity. In gaining the optimal result, the intervention should be applied long-term. As the previous study, the intervention was done for six months in elderly with pneumonia, supported by routine monitoring through a telephone call to measure nutritional intake [18]. In addition, nutrition intervention was insufficient if physical activities did not accompany it. A need to combine nutrition fulfillment and physical activity to maintain quality of life and lowering illnesses risk in the elderly [40]–[42].

Based on these concerns above, this study's emerging limitations include a lack of control of potential confounding variables such as disease history, physical activity, and intake composition before the test [30]. Besides, there is also a limitation in intervention terms that might need to be applied longer than three months to get more valid results. However, this research also has a strength in that we examine the blood profile comprehensively, and the results strengthen the theory that nutrition intervention has a significant role in someone's blood profile and health. A future study is needed to explore further the effect of nutrition intervention in the elderly with a randomized control trial approach, which considers the potential confounding factors.

4. CONCLUSION

The nutritional intervention significantly affected the hematology profiles of the participants. However, we can conclude that the three months of the intervention itself are insufficient to improve participants' biochemistry profiles. Additional control groups and controlled variables might be needed to improve the results, such as dietary intake before the test, disease history, and physical activity. The limitations of this study may be an essential consideration for a more comprehensive future study.

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